Extended Abstract

Review and Research: Journal of Engineering And Technology

2021

Vol.10 Issue 6

The potential of autonomous driving technologies for low-cost city cars

Mario Hirz
Graz University of Technology, Austria

Abstract:

Automated driving functions are able to increase vehicle safety and customer comfort. They also have potential to improve road traffic management and to reduce negative impacts of traffic on environment. In this way, car manufacturers, supplier and research institutes increasingly perform R&D activities in the area of automated driving on the way to the self-driving car. The submitted work treats an evaluation of automated driving functions for the application in electrically driven low-cost city cars. The intended evaluation is focused on SAE level 5, which means fully automated cars that do not require a driver, and even no passengers. This type of vehicles might not only be used for logistics, delivery service and similar applications, but also as self-driving people mover. Autonomous navigation of such vehicles is similar to those of robots, which includes tasks of localization, path planning, and path execution. These tasks require appropriate sensor systems and computation strategies to recognize and cluster continuously changing environmental conditions in daily traffic scenarios. The applied sensor and object recognition technology, representing cost-intensive modules plays an important role. In this context, different sensor technologies are evaluated in terms of their capability of road and surrounding area observation, driveway and obstacle recognition, the robust provision of data for vehicle control and path planning as well as economic parameters. Sensor fusion comes to use to combine advantages of different technologies and to provide reliable object detection under different environmental conditions. The paper closes with exemplary applications of autonomous driving technologies in small city vehicles and a prospect of development trend.

Fast advances in autonomous driving technology trigger the question of suitable operational models for future autonomous vehicles. A key determinant of such operational models' viability is the competitiveness of their cost structures. Using a comprehensive analysis of the respective cost structures, this research shows that public transportation (in its current form) will only remain economically competitive where demand can be bundled to larger units. In particular, this applies to dense urban areas, where public transportation can be offered at lower prices than autonomous taxis (even if pooled) and private cars. Wherever substantial bundling is not possible, shared and pooled vehicles serve travel demand more efficiently. Yet, in contrast to current wisdom, shared fleets may not be the most efficient alternative. Higher costs and more effort for vehicle cleaning could change the equation. Moreover, the results suggest that a substantial share of vehicles may remain in private possession and use due to their low variable costs. Even more than today, high fixed costs of private vehicles will continue to be accepted, given the various benefits of a private mobility robot. Autonomous vehicles (AVs) are expected to revolutionize mobility by turning cars into mobility robots and allowing more dynamic and intelligent forms of public transportation. A multitude of transport services are conceivable with AVs, yet it is largely unclear which ones will prevail.

This work is partly presented at 5th International Conference and Exhibition on Automobile and Mechanical Engineering| September 20-21, 2018 | Rome, Italy